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ABSTRACT

The purpose of this study was to compare the shop achievement of secondary vocational-technical students who received one year versus two years of Area Vocational/Technical School (AVTS) instruction. One group attended the AVTS for both the 10th and 11th grade, while the other attended only for the 11th grade year. The criterion variable used to make the comparison was the Ohio Trade and Industrial Education Achievement Test. When ability was not taken into consideration, the one year group did at least as well as the two year group in terms of shop achievement. When differences in ability were taken into account the finding suggests that those students who received twice as much instruction did somewhat better on the shop achievement test as a total group. Beginning AVTS instruction in 10th grade appears to result in greater shop achievement at the end of 11th grade than taking shop only in 11th grade; however, the amount of increase in achievement appears to be small and may not be of practical importance. Differences are variable from one specific trade knowledge area to another, and from one shop program to another. The importance of any differences depends somewhat on what basic knowledge is necessary to a specific trade or trade area. Some shop programs may suffer more than others from the elimination of the 10th grade year. (Author/NM)

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VOCATIONAL
EDUCATION

SHOP ACHIEVEMENT AS AN OUTCOME OF ONE YEAR VERSUS TWO YEARS OF AVTS INSTRUCTION

PAUL L. McQUAY

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
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Shop Achievement as an Outcome of One Year Versus Two Years of AVTS Instruction

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University Park, Pennsylvania

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Pennsylvania Department of Education
Bureau of Vocational, Technical and Continuing Education
Research Coordinating Unit
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PREFACE

This monograph is the eighteenth in a series of such reports which have been published as part of the longitudinal Vocational Development Study (VDS) project. The project was begun in the Fall of 1968 and since that time has focused on longitudinal data collection and research in order to help provide answers to questions concerning the vocational development process and the evaluation of vocational education programs. The VDS project is jointly sponsored by the Department of Vocational Education at Penn State and Pennsylvania's Research Coordinating Unit (RCU) in Vocational Education.

The research reported here by Paul McQuay is of a program evaluation nature. It is aimed at answering an important curriculum question dealing with the relative merits, in terms of student shop achievement, of beginning AVTS instruction in tenth grade as opposed to eleventh grade. In addition to providing tentative answers to the major question posed for the study, the findings go beyond the question in pointing out the complexities of program evaluation, where comparisons are made among different groups of students undergoing different educational treatments. The results of this study yield implications which should be of concern to all curriculum planners, but are of particular usefulness to those involved in adopting a career education curriculum format for the high school years.

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VDS CAPSULE

This blue page section has been included in this report in order to provide a brief summary of the findings and implications of this study. Teachers, counselors, administrators, and others interested in Vocational-Technical education hopefully can determine through this capsule whether or not the full report warrants their investigation. The purpose of this study was to compare the shop achievement of secondary vocational-technical students who received one year versus two years of AVTS instruction (one group attended the AVTS for both the tenth and eleventh grade while the other attended only for the eleventh grade year). The criterion variable used to make this comparison was the Ohio Trade and Industrial Education Achievement Test (OTAT). A brief description of the major findings is followed by a listing of some of the possible implications which may be drawn from the findings.

Findings

1. The study sought to investigate the relative benefits of beginning AVTS instruction in tenth as opposed to eleventh grade. When ability was not taken into consideration, the one year group did at least as well as the two year group in terms of shop achievement (OTAT).

2. The two groups selected for study were not equal in terms of ability and since ability is highly related to achievement in most cases, it was necessary to take ability into consideration when making comparisons.

3. When differences in ability were taken into account the findings suggest that those students who received twice as much instruction did do somewhat better on the shop achievement test as a total group.

4. When the question of achievement differences was examined independantly for each of five shop groups (Automotive, Machine Trades, Auto Body, Carpentry and a Mixed group of shops consisting of: Welding, Electricity, Electronics and Mechanical Drafting) only the Mixed group yielded significant differences in achievement. The lack of differences in shop achievement for the individual shops can, for the most part, be attributed to small sample size.

5. The two groups selected for study were also compared on OTAT subpart scores to further identify where differences and similarities existed. The profiles generally show the one year group to possess higher achievement than the two year group apparently due to ability differences which are also evident on the profiles. However, there are evidences of reversals in the pattern in a number of specific trade knowledge areas.

Implications

1. When making comparative evaluations of the effectiveness of vocational programs it would be a great mistake to assume that all other factors affecting student achievement are equal and that differences found are due to the treatment (e.g., the teacher, the curriculum, etc.).

2. Student ability is one obvious factor which must be considered in evaluating educational programs. Affective factors such as maturity,

interests and values also probably play a significant role. Because of the potentially great differences which may exist among groups of students, comparative studies (whether among vocational programs or between vocational and non-vocational programs) which do not consider all possible differences are likely to reach the wrong conclusions, especially concerning cause and effect relationship.

3. Beginning AVTS instruction in tenth grade does appear to result in greater student shop achievement at the end of eleventh grade than if only (one year) eleventh grade instruction is undertaken. However, the amount of increase in achievement appears to be small and may not be of practical importance. By the end of twelfth grade, it is possible that the differences may disappear altogether.

4. While certain gains in achievement are apparent for the tenth and eleventh grade group over the eleventh grade only group, the differences are quite variable from one specific trade knowledge area to another and from one shop program to another. Therefore, the importance of any differences depend somewhat on what is absolutely necessary to know about ones trade and what trade area is being considered. Some shop programs may suffer more than others from the elimination of the tenth grade year.

I

ORIGIN OF THE STUDY

Introduction

In 1917, a pioneering piece of legislation, the Smith-Hughes Act, provided the first major stimulus for federally supported vocational education programs. The Smith-Hughes Act appropriated 7.2 million dollars to be directed to the states for distribution to local programs. Three occupational areas were supported and eligible for the funding: agriculture, trades and industry, and home economics. The ensuing years brought about other major legislation affecting vocational education. In 1936, the George-Deen Act added distributive occupations to vocational education authorizations. Amended in 1946 to become the George-Barden Act, this act has the distinction of providing more flexibility in designating how funds should be used and included vocational guidance in its provision. The Health Amendment of 1956, added practical nursing programs to the act. In response to the technological advances being made by the Russians, especially in terms of space exploration and Sputnik, Congress passed the National Defense Education Act in 1958 to improve the quality of elementary and secondary education, particularly in the technical areas. The rationale for passage of this act was that strength in this area was essential to the national security. In reply to the high rate of unemployment in the nation and the continued threat of technological displacement of workers, Congress passed the Manpower Development and Training Act in 1962. This act provided funds for training and retraining of unemployed workers so that they could

secure jobs. However, not until the passage of the Vocational Education Act of 1963 did federal vocational legislation focus on people in need of vocational education, a departure from all previous legislation which focused on type of occupation. This act was much more flexible than previous legislation, and added business and office occupations to the list of fundable programs. Additionally, it approved funds for courses at the post-secondary level, and specifically included courses in community or junior colleges, area vocational schools and comprehensive high schools. Funds for research was another unique aspect of the 1963 Vocational Education Act. Unlike earlier legislation, the 1963 Vocational Education Act required that State and Local programs be subject to evaluation for relevance and quality, and provide a systematic program of national evaluation to be conducted by a special ad hoc commission every five years (United States Department of Health, Education and Welfare, 1968).

Due in part to the funding that is being made available for support of vocational education and the questionable relevance traditional education holds for some individuals, vocational education has grown in both size and scope. It was reported by the United States Department of Health, Education, and Welfare that during 1969, secondary education programs received about 31 percent of the funds spent for vocational education under the 1963 Vocational Education Act. With the total expenditure increasing from $364,978,936 in 1968 to $451,033,667 (approximately 86 million dollars), with the federal proportion increasing from $67,969,615 to $70,602,561 (approximately 2.6 million dollars) during this same period. The number of students in secondary vocational programs also increased from 3,842,896 in 1968 to 4,070,395 in 1969.

During this same period most occupational programs also grew, as witnessed by the fact that the range was from 1.5 percent in agriculture to 10.8 percent in health occupations. The only exception to this growth was in technical education which decreased 12.3 percent (United States Department of Health, Education, and Welfare, 1969).

The federally supported occupational areas have also grown from three to six since the initial piece of federal legislation of 1917. Over the years our philosophy of education has changed considerably, particularly the philosophy of formal school based vocational education. Some schools have seen a separation of the vocational programs from the traditional educational programs into a completely self governed system.

In spite of these changes Evans (1971) states vocational education is almost non-existent below the ninth grade. Evans further states, "The little (vocational education) that exists (below ninth grade) is found in large city schools for the chronic truants, the mentally retarded, and other students who for some reason have not secured enough credits to admit them to secondary school . . ." (Evans, 1971, p. 165). Three reasons he cites for the fact that vocational education does not begin until high school are:

1. Vocational education is understood by most educators to be highly specialized and hence not an appropriate part of the general education programs of the elementary school and junior high school.

2. Specialized vocational education is best offered close to the time a person will use this education in employment. It is almost impossible for a person to secure meaningful employment before age sixteen, two years after the typical student leaves the eighth grade.

3. There are few examples of integrated curriculum plans which bridge the gap between elementary and secondary schools. Thus, even pre-vocational education is nearly non-existent below the ninth grade (Evans, 1971, pp. 165-166).

Keeping in mind Evan's observation concerning vocational education, it was refreshing when former Commissioner Marland, of the United States Office of Education set about to implement major reform in our present educational system. The United States Office of Education has proposed a school based plan that is designed to guarantee all students, graduates and dropouts, the opportunity to develop an entry level skill and the necessary background should they wish to pursue further education. According to Marland, "Career education increases the relevance of school by focusing on the learner's career choice. It gives students informed guidance, counseling and instruction throughout their school years" (United States Department of Health, Education and Welfare, 1971, p. 3). The school based portion of Career Education as proposed will begin in kindergarten with the main focus upon career awareness and should continue through secondary education and on into adulthood using a system of continuing education.

While some schools of thought advocate a career awareness at the age of four, others cite reasons why very little has been done to date to begin vocational education before high school. Then, there are those who suggest students might not be vocationally mature enough to make vocational decisions at the beginning of their high school education.

Generally, it has been accepted that in the ninth grade (at approximately 14 years of age) students would make certain curricula decisions that have an important bearing on their vocational future. This decision tracks the individual into one of several curriculum selections that are for the most part the beginning of an irreversible career pattern, (i.e., the student that chooses the academic track can go on to

college after high school, but the student that chooses the vocational track is locked into that system for the most part and usually cannot easily go on to college if he/she does experience a change in occupational goal). Besides being locked into a vocational curriculum the student is committed to a specific occupation at a time when individuals might not be ready to make occupational decisions.

It was stated by Evans (1971) that because of the high degree of specialization of vocational education, with few exceptions, it has not begun until high school. In an attempt to answer the question concerning the readiness of ninth grade boys to choose among different occupations, Super and Overstreet (1960) report:

> . . . the data of this study suggest that a substantial number of boys are not yet ready, in the ninth grade, to decide on direction of endeavor, or, specifically, on a future occupation. This early adolescent stage is one, not of making and implementing a vocational choice, but rather of developing planfulness, of preparing to make a series of educational and occupational decisions (Super and Overstreet, 1960, p. 152).

If, as Super and Overstreet's data suggests that ninth grade boys are not ready to make occupational decisions, the question remains, what is the grade at which youths can be considered mature enough to formulate occupational decisions. Specifically, is an occupational decision more appropriate in the tenth grade or the eleventh grade?

Statement of the Problem

The general purpose of this study was to examine the difference in shop achievement between students who had entered a specific vocational program in tenth grade as opposed to eleventh grade. This study consisted of two groups of vocational students, the first group of students had completed both the tenth and eleventh grades of the vocational

program and the second group had completed only one year of study (the eleventh grade) of the same vocational program. The shop achievement of these two groups was measured by the Ohio Trade and Industrial Education Achievement Tests (OTAT) total score.

The specific purpose of this study was to examine the differences between these two groups in an attempt to answer the following questions:

1. Is there any difference in shop achievement, as measured by the OTAT total score between the group of students that have completed two years of vocational education (tenth and eleventh grades) and the group of students that completed one year (eleventh grade only) considering all occupations together?
2. Is there any difference in shop achievement, as measured by the OTAT total score, between the two groups of students (tenth and eleventh grade versus eleventh grade only) for the following occupational shops?

Shop Areas

I. Automotive Mechanic

II. Machine Trades

III. Auto Body

IV. Carpentry

V. Mixed Group (consisting of the following shops: Welding, Electricity, Electronics, and Mechanical Drafting)

3. Do the profiles of the two groups of students (tenth and eleventh grade versus eleventh grade only) differ on the OTAT subtest scores for each shop area?

II

REVIEW OF RELATED LITERATURE

Introduction

In order to identify research studies or published materials which contain relevant information for this study, a review of the related literature was conducted. The literature reviewed was grouped into the following two categories:

1. Publications concerning career development which relate specifically to the theoretical aspects of this study.
2. Studies or other publications which relate to the criterion (Ohio Trade and Industrial Education Achievement Tests) used in this study.

In an effort to place this study in proper perspective, a variety of pertinent literature such as books, periodicals, journals, dissertations, and unpublished materials were reviewed. But, rather than reproducing the studies in total, only those parts that are relevant to this study will be discussed.

Publications Concerning Career Development Which Relate Specifically to the Theoretical Aspects of This Study

The theoretical premise of this study focuses on whether students are more ready to make educational/occupational selections at one particular time as compared to another. The assumption is, that students who are better prepared (vocationally mature) to make a selection should perform better (educationally as well as occupationally) than students that are not ready to make this selection.

Herr and Cramer (1972) feel that the appropriate term to use in describing vocational development is "vocationalization." They consider vocationalization, or vocational development to be analogous to the more familiar term "socialization." Socialization being described as a maturity process in which the child begins to accept and internalize the beliefs and norms controlling the inter-action of people. Additionally, they view socialization as a process of articulation of the psychological self with the structure of the social system. Similarly, they feel that:

> . . . the process of vocationalization, or vocational development, speaks to the various inputs--psychological, sociological, cultural, economic--which across time results in such outcomes as effective vocational behavior, decision-making ability, and vocational maturity. Vocationalization, in sum, has to do with those processes and factors which aid or impede young people's acquisition of the value, knowledge, and skills which lead to effective vocational behavior (Herr and Cramer, 1972, p. 29).

This seems to suggest that vocational maturity is a developmental process, with events taking place at fairly precise times in an individual's life. Ginzberg reports that: "Occupational choice is a process; the process is largely irreversible; compromise is an essential aspect of every choice" (Ginzberg, et al., 1951, p. 186). Then, Super (1953), who seemingly was stimulated by what Ginzberg had done, published as part of his Career Pattern Study, a developmental theory.

The original vocational behavior theory of Super (1953) contained ten propositions and five vocational life stages, which were revised in 1957, to include eleven propositions and the original vocational life stages. Because of the importance of some of the propositions to this study, those that are most relevant are reproduced here in full.

1. Vocational development is an ongoing, continuous, and generally irreversible process.

2. Vocational development is an orderly, patterned process and thus predictable.

3. Vocational development is a dynamic process of compromise or synthesis.

4. Self-concepts begin to form prior to adolescence, become clearer in adolescence, and are translated into occupational terms in adolescence.

5. Reality factors (the reality of personal characteristics and the reality of society) play an increasingly important part in occupational choice with increasing age, from early adolescence to adulthood.

6. Identification with a parent or parent substitute is related to the development of adequate roles, their consistent and harmonious interrelationship, and their interpretation in terms of vocational plans and eventualities (Super, 1957, pp. 89-96).

Kapes (1971), as a member of a team at The Pennsylvania State University, Department of Vocational Education publishes as part of the Vocational Development Study a Monograph (Number 2), which explores the relationship between selected characteristics of ninth grade boys and curriculum selection and success in the tenth grade. Extracted directly from this study is Kapes' "Summary" of information uncovered in reviewing the literature and reproduced for its relevance to this study (Kapes, 1971, pp. 33-34).

Summary

1. Super's theory of career development has evolved considerably since its inception in 1951 and at the present time it appears to be most promising for explaining vocational behavior (Super, 1953, 1963, 1961, 1969a; Super, et al., 1957, 1960; Tiedeman, et al., 1963).

2. The career model appears to have replaced the occupational model in much of vocational development research (Super, et al., 1957; Super 1961, 1969a, 1969b; Tiedeman, 1961; Tiedeman, et al., 1963).
3. The concept of stages of career development is fairly well accepted among psychologists, sociologists and career development researchers (Buehler, 1933; Miller and Form, 1951; Ginzberg, 1951; Super, et al., 1969a; Tiedeman and O'Hara, 1963).
4. Most career development researchers appear to be in agreement concerning the end on ninth grade as a critical vocational decision point at which to study the constructs and determinants of career development (Super, et al., 1957, 1960; Crites, 1961; Jordaan, 1963; Tiedeman and O'Hara, 1963).
5. Super's theoretical model appears to lend itself well to the type of study of vocational development and career prediction model proposed and explored by Cooley and Lohnes (Cooley and Lohnes, 1968; Super, 1969a, 1969b).

In conclusion it can be stated that students have had to make educational decisions at the end of the ninth grade. For the most part, these decisions tracked them into one program or another with little regard to whether they were ready or not. Super and Overstreet (1960) state "in grade nine vocational maturity is not characterized as goal-attainment, as the having of consistent, realistic preferences, nor as having begun to make a place for oneself in the world of work" (Super and Overstreet, 1960, p. 63). Recently a study conducted by Gribbons and Lohnes (1967) has shown that this might not be true for all. Their

study suggests that some degree of vocational maturity is a reality for some students in the eighth grade. They even go so far as to suggest that among a few students vocational maturity might be present even earlier than the eighth grade

Generally both studies allude to a period of readiness. Super and Overstreet (1960) suggest vocational maturity is not present in ninth grade. Then again, Gribbons and Lohnes (1967) found that some students are vocationally mature to make occupational decisions at least by the time they are in the ninth grade.

Studies or Other Publications Which Relate to the Criterion (Ohio Trade and Industrial Education Achievement Tests) Used in This Study

Vocational/technical education has long been void in developing objective means of assessing student learning. In 1958, at the demand of Ohio educators, the Ohio Trade and Industrial Education Achievement Test (OTAT) to measure success in trade areas were developed at the Ohio Trade and Industrial Education Local Supervisors Workshop. The tests were specifically constructed to evaluate and diagnose vocational achievement. Prior to 1963, the use of these tests were limited to Ohio. However, since then, several states as well as the District of Columbia and individual schools have requested and used the test battery (Department of Education, State of Ohio, 1972).

The purpose of the OTAT is outlined by the following eight goals:

1. to help determine if the objectives of instruction have been achieved.
2. to provide a basis for reviewing the curriculum and improving instruction.
3. to provide motivation for students and teachers.

4. to identify facility and equipment deficiencies.
5. to assist in the process of supervision.
6. to help identify strengths and weakness of the instruction.
7. to help identify strengths and weaknesses of the student.
8. to help evaluate reference materials (Department of Education, State of Ohio, 1972, preface).

In discussing the OTAT as a predictor of achievement, Finch and Bjorkquist (1970) call attention to the fact that as a paper and pencil test, it measures the academic component of achievement rather than performance in the shop or laboratory. They further state, that although relationships have been found between OTAT test scores and course grades (instructor's ratings) in a training environment, no studies have been found that examine the relationship of OTAT test scores with actual job performance in the work situation.

In an attempt to assess the criterion-related validity of the OTAT, Kapes and Long (1971) conducted a study, published in the Journal of Industrial Education. Their findings suggest, that although the OTAT total test score may validly measure that portion of achievement related to knowledge of course content, it measures only a small portion of that criteria that constitutes shop grades. Kapes and Long conclude that, shop grades probably are influenced by a number of complex circumstances, some of which are not measured by the OTAT. They further state that the OTAT, a paper and pencil test, may be useful in evaluation of course content. Additionally, they report that the OTAT is a stable predictor of students' success in vocational programs.

Enderlein (1972) found the OTAT total score to be a more objective measure of achievement than teacher grades. He further suggests that

end-of-course shop grades did not contain the same information as the OTAT and at the same time was unable to determine if end-of-course shop grade was a valid measure of achievement. However, the OTAT shop scores were found to correlate significantly with shop grades. But, as a pencil and paper instrument the OTAT was found to be a cognitive-oriented measure and was not found useful in assessing manipulative skills.

Summary

1. The OTAT is a stable predictor of students' success in vocational programs (Kapes and Long, 1971).
2. A significant correlation seems to exist between OTAT scores and end-of-course shop grades (Enderlein, 1972).
3. Caution should be used in certain applications of the OTAT (Finch and Bjorkquist, 1970; Kapes and Long, 1971).
4. One objective of the OTAT is to provide a basis for reviewing the curriculum and improving instruction (Department of Education, State of Ohio, 1972).

III

PROCEDURE

Community and Sample

The following is a description of the community and sample under consideration, it is not intended to be extensive, nor detailed. A more descriptive, detailed over-view is included in a study titled, The Ninth Grade Characteristics of Students Entering Different Tenth Grade Curricula: VDS Williamsport Sample, Monograph Number 12, which is part of a longitudinal study under investigation at The Pennsylvania State University.

Instead, included herein is a brief description of the community and sample, including: the history, population, economy, housing, land use, finance, transportation, social needs and characteristics, educational system, and study sample, needed to give the reader an understanding of those community factors effecting the Williamsport sample.

Williamsport is located in north central Pennsylvania in Lycoming County. It was once known as the "Lumber City," because of the timber industry which abounded there, producing 300 million feet of sawed lumber each year. After exhaustion of the timber, the city turned to an industrial base, which provided a modest amount of prosperity for the community.

Williamsport was chosen as the location of the county seat of Lycoming County in 1796, because of its level land and accessibility to the hopefully navigable Susquehanna River. It was chartered as a Borough in 1806 and incorporated as a City in 1866.

The city experienced a steady continuous population growth from 1890 to 1930. The population reached its apex of 45,729 in 1930. From 1930 to 1950 the population held fairly stable, and after 1950 it began to decline, until 1970 when it reached 37,918. The Lycoming County Planning Commission is projecting to 1980 a slight decline in population reaching a low of 36,500 and then forecasting a modest increase to the year 2000 with the population reaching 40,400.

The present economic base of Williamsport centers on manufacturing, wholesaling and retail trade, and services, which account for 85 percent of the employment, with manufacturing clearly being the dominate economic activity. The future economic growth is very difficult to predict because of the multitude and complexity of all the variables involved.

Williamsport is composed of five neighborhoods, namely: West End, Central, North End, East End, and Downtown. The declining population reflects a low percent of new housing construction taking place. Only 7.8 percent of the houses have been built in the past 20 years, as compared with a statewide figure of 31.9

The majority of the early growth of Williamsport was close to the river. Because of construction along the river, the town has taken on an east-west growth pattern. The total land area is 9.1 square miles; with approximately 70 percent of this area developed and 30 percent vacant. The largest single use of the developed area is residential, constituting approximately 36 percent of the useable area.

As a result of a decreasing population and the closing of commercial enterprises, coupled with an increase in the demand for public service requirements, Williamsport has experienced financial chaos. In order to offset this financial dilemma the city derives its major source

of revenue from real estate taxes. Additional revenue is derived from a per capita tax, $20 per resident over 21 years of age; income tax, one percent; occupational privilege tax, $10; and occupation tax, 160 mills on value of occupation.

The major forms of transportation available to Williamsport are: road, rail, and air. Following the trend of the United States, Lycoming County has adapted an overwhelming reliance on motor vehicles as the primary mode of transportation. From 1960 to 1970 the registration of motor vehicles has increased 46 percent in the county. Railroads no longer provide passenger service to the community. However, the Reading Railroad and the Penn Central serve Williamsport with rail freight service. Truck terminals are an important industry in Williamsport, because of its geographic location as the center of north central Pennsylvania. Daily air commuter service is available providing service to Washington, Philadelphia, and Albany.

The mean family income in Williamsport in 1970 was $9,175 as compared to the Pennsylvania mean income of $10,877, which is among the lowest family income of the Pennsylvania cities. This low income figure has been attributed to the heavy out migration of the 25-44 age group.

The ethnic make-up of Williamsport demonstrates its long existence with a stable population. Of the total population, less than 10 percent are foreign born or have foreign born parents. Of the foreign born, Italians and Germans are the most prevalent. By race, the largest non-caucasian population is Black, with 1,121 persons, compared to 942 in 1960 representing a 19 percent increase

The city of Williamsport is part of the Williamsport Area School District, which includes Lewis, Hepburn, Lycoming, Old Lycoming, and Woodward Townships (all in Lycoming County). The school district encompasses an area of 98 square miles and is under the administrative control of a nine-member board of directors and one superintendent. The system follows the organizational concept of K-6-3-3, (K = kindergarten; 6 grades in elementary, 3 grades in junior high and 3 grades in high school). There are 19 public schools in the district, which include: 15 elementary, 3 junior highs, and one senior high.

A new senior high school was completed in 1971, and has a capacity of 2,700 students. The present enrollment is 2,300 students. A wide variety of courses, except vocational courses, are provided at the new high school. The vocational courses are offered as part of the Area Vocational School at the Williamsport Area Community College.

The Williamsport Area Community College also operates within the city. Although the major emphasis of the college focuses on the occupationally oriented programs, it also provides a comprehensive Liberal Arts and Sciences program.

The Williamsport area has one four-year liberal arts institution, Lycoming College. This school is related to the United Methodist Church and has an enrollment of 1600 students. The close-working relationship between Lycoming College and the City makes it an important entity in Williamsport.

Study Sample

During the fall of 1968 the Department of Vocational Education at The Pennsylvania State University undertook a ten-year longitudinal

Vocational Development Study (VDS). The study was initiated to investigate the effects of certain high school experiences and decisions made by students in an attempt to isolate factors that could be pertinent to curriculum planning and guidance. The sample from the Williamsport area was not added to the project until 1970. All high school students from the Williamsport High School who graduated as the class of 1974 were included in the sample. The original (1970) Williamsport sample consisted of approximately 900 students. The graduating Williamsport sample consisted of approximately 750 students.

The Williamsport student sample under consideration as part of this study was initially tested and inventoried during the Winter of 1970-71. The testing and inventoried material collected consisted of students' abilities, interests and biographical information; along with their data file for the seventh grade through tenth grade. This study utilized the criterion variable OTAT that was administered only to the eleventh grade vocational curriculum portion of the much larger sample. This data was collected during the spring of 1973. The Williamsport vocational sample size was 71.

The contrast group with which the Williamsport sample was compared consisted of a totally non-Williamsport sample. Both groups were enrolled in vocational classes at the vocational school that is offered as part of the Williamsport Area Community College. The non-Williamsport sample consisted of 46 students that had completed both the tenth and eleventh grades in the shop area in which they were measured. A closer breakdown by shop areas and numbers of students in each area follows.

Tenth and Eleventh Grade, and
Eleventh Grade Only Sample by Shops

	Tenth and Eleventh Grade	Eleventh Grade Only
	N	N
1. Automotive Mechanics	11	10
2. Machine Trades	9	5
3. Auto Body	5	9
4. Carpentry	14	19
5. Mixed Group (Welding, Electricity, Electronics and Mechanical Drafting)	7	28
Total	46	71

Because of the small numbers in the electrical, electronics, mechanical drafting, and welding shops, these shops were grouped together and analyzed as a single identity titled mixed group.

Essential Data

The Ohio Trade and Industrial Education Achievement Test

The Ohio Trade and Industrial Education Achievement Test (OTAT) is a test battery designed to measure achievement in trade and industrial areas. This test battery is specifically designed for the evaluation and measurement of vocational achievement. The OTAT is composed of sub-tests which vary in number from one shop area to another. The number of sub-tests range from a low of eight in the electronics area to a high of eighteen in the mechanical drawing area. The number of items

vary within the sub-tests and the total test score is composed of the sum of the items in the sub-tests within each individual area. Each total test contains a large number of items and the reliability coefficients (KR-20) for the total test scores range from .83 to .95; however, no reliability coefficients are reported for the sub-tests. Because of the lack of reliability information of the sub-tests it was decided that the total score was the only useful measure of achievement for the purpose of this study.

Taking into consideration that the total test scores differ in number of items for each shop area, the OTAT total scores were converted to standard scores for each of the eight shop areas (Automotive Mechanics, Machine Trades, Auto Body, Carpentry, Welding, Electricity, Electronics and Mechanical Drafting). The standard score selected had a mean of 50 and standard deviation of 10. The procedure used for the conversion was based on each individual's raw mean score for the total test in his shop area. This score was then compared to the percentile score based on the OTAT achievement test Ohio State norms for that shop. This percentile was then converted to a standard score.

California Short Form
Test of Academic Aptitude

In addition to providing sub-test scores and a total score for each shop, the OTAT also includes a test of academic aptitude, referred to as the California Short Form Test of Academic Aptitude, Level 5. This test is composed of four sub-tests, each separately timed. The sub-tests are in two major sections, one is language, the other is non-language. The language section consists of; vocabulary and memory, while the non-language section consists of; analogies and sequences.

Analysis

The hypothesis test usually employed to test the difference between the means of two samples, $\bar{X}_1 - \bar{X}_2$, is equal to zero against the alternative hypothesis that the means are different from zero is the t test. However, the major difficulty with this method of testing is that the test is non-robust if the assumption of homogeneous variances is not met (Glass and Stanley, 1970). In order to overcome the violation of homogeneous variances, a statistic generally referred to as the Behrens-Fisher t' can be used. This test does not require homogeneous variances or equal N's.

The statistic was originally studied by Behrens (1929) and was explored further by Fisher (1935), is as follows:

$$\frac{\bar{X}_1 - \bar{X}_2}{\sqrt{s_1^2/n_1 + s_2^2/n_2}}$$

In discussing the Behrens-Fisher test (t'), Kohr (1970) states, "the test worked very well with only a very slight loss of power compared to the t test when all assumptions are met. When the assumptions were not met, and $n_1 \neq n_2$, it [Behrens-Fisher (t')] was much better than the t test."

According to Games (1972), the Behrens-Fisher (t') is a big improvement over the regular t because it protects against the violation of homogeneous variances. Additionally, he suggests that any time in doubt as to which test to use--the universal application should be the Behrens-Fisher test (t').

The statistical methodology utilized in this study tested the hypothesis that $\bar{X}_1 - \bar{X}_2 = 0$ (for each of the shops and for the mixed group) between the group of students receiving one year of shop instruction as compared to a group receiving two years.

Research seems to indicate that much error in experimentation may be traced to those characteristics of individual subjects that correlate highly with the dependent variable (in this case the total score for each shop on the OTAT). For example, evaluation of the effects of the shop achievement as measured by the OTAT would be difficult to interrupt, if the general intelligence level of the individuals differed. Variability in intelligence among subjects increases variability in performance within groups. Furthermore, if the average intelligence is higher for some groups than for others, the effects of the independent variable may be either obscured or spuriously enhanced (Myers, 1972).

To insure homogeneity of intelligence between groups (the tenth and eleventh grade versus the eleventh grade only), the achievement as measured by the California Short Form Test of Academic Aptitude were compared using the Behrens-Fisher t' test. The results of this test are shown in Table 1.

The results of this test (Behrens-Fisher t') reveal that the mean intelligence score of the one year sample (eleventh grade only) is 54.85 with a standard deviation of 12.13. This compares to a mean intelligence score of 48.72 and a standard deviation of 11.23 for the two year group (tenth and eleventh grade). The results of this test produced a t-value of 2.792. This value is significant at the .01 level, suggesting that the one year group has an intelligence advantage over the two year group. Thus the results of the t test between the

different shops might not be solely attributed to the amount of exposure to a given instructional program, but might addititionally be attributed to a learning advantage (intelligence).

Table 1. Mean Scores, Standard Deviations and t-Value for the California Short Form Test of Academic Aptitude as Measured by the Ohio Trade and Achievement Test

Group	N	$\overline{X}$	S.D.	t-value
Tenth and Eleventh Grade	46	48.72	11.23	
				2.792*
Eleventh Grade Only	71	54.85	12.13	

*Significant at .01 level.

In order to overcome the difference of intelligence, a technique suggested by Myers (1972) will be used. The technique is the analysis of covariance. According to Myers (1972), this approach assumes that some portion of the usual error is predictable if we have knowledge of the individual's score on some related measure, X_1, the covariate. Elimination or removal of the variance of these predicted error components leaves a smaller error variance and thus a more efficient, more powerful test of treatment (OTAT) effects.

However, the author realizes a weakness in this test for this particular study, namely this test (analysis of covariance) requires normally. It is hardly likely that the samples under consideration are normal because of the small N's in each group. Thus, presented in a later chapter are both a Behrens-Fisher t' test with the intelligence

differential playing whatever role it will, and an analysis of covariance test (with removal of the intelligence factor) comparison between groups and shops. In each case the results of both tests have been reported in t values and probabilities of obtaining the observed t value by chance.

Profiles were constructed for each sub-test for the following shops: Automotive, Auto Body, Metal Trades and Carpentry. The sub-test group means were converted to percentiles based on the Ohio State norms. Profiles on the other shops were not constructed because of the small N's in those areas.

IV

FINDINGS

Introduction

The results of this investigation are reported here in terms of the research questions presented in the statement of the problem. All statistical information relevant to each question in this study is presented in tables and figures and is discussed only to sufficiently explain and interpret its meaning. Any conclusions that may be supported by this data are reported in Chapter 5.

Question #1

> Is there any difference in shop achievement, as measured by the OTAT total score between the groups of students that have completed two years of vocational education (tenth and eleventh grades) and the group of students that completed one year (eleventh grade only) considering all occupations together?

In an attempt to answer this question the two different samples (one having completed two years of vocational education, the other completing only one year) were compared using the Behrens-Fisher t' test and the analysis of covariance.

The results of the t' test between the two groups are shown in Table 2 and reveal a mean score of 48.10 with a standard deviation of 7.92 for the students that had studied in the vocational shops for one year (eleventh grade). Whereas, the other group of students that have

Table 2. Group Means, Standard Deviations, Coverted Group Means and t-Values for the Four Curriculums (Carpentry, Auto Body, Machine Trades, and Automotive), Mixed Groups, and Totals (One Year versus Two Years).

Analyses	Total (n=71)[a] (n=46)[b]	Automotive (n=10) (n=11)	Machine Trades (n=5) (n=9)	Auto Body (n=9) (n=5)	Carpentry (n=19) (n=14)	Mixed Group[c] (n=28) (n= 7)
t-test						
1-year (mean)	48.10	52.80	48.00	52.67	49.21	44.21
S.D.	(7.92)	(10.87)	(2.24)	(8.34)	(7.20)	(5.98)
2-years (mean)	50.48	50.36	48.67	48.20	51.21	53.14
S.D.	(9.66)	(9.77)	(9.11)	(7.01)	(12.44)	(6.62)
t-value	-1.394	.538	-.209	1.066	-.540	-3.253
Significance Level	N.S.	N.S.	N.S.	N.S.	N.S.	.01
Covariance						
Converted Means						
1-year	47.32	51.02	44.92	51.91	48.36	44.15
2-years	51.68	51.98	50.38	49.56	52.37	53.41
t-value	-2.862	.208	-1.745	.607	-1.520	-3.694
Significance Level	.01	N.S.	N.S.	N.S.	N.S.	.01

[a]Sample of students with one year of shop experiences

[b]Sample of students with two years of shop experiences

[c]Consisting of students from the following shops: Welding, Electricity, Electronics, Mechanical Drafting

been in the vocational shops for two years (tenth and eleventh grade) had a mean score of 50.48 with a standard deviation of 9.66. The t' test produced a t-value of -1.394, which was not significant at the .05 level.

Therefore, the answer to this part of question number one is--no it does not appear to make a difference if students receive one year of vocational instruction or two years. That is, their mean OTAT total scores were not significantly different. However, it must be pointed out that the two groups differ in terms of intelligence, as detected by an analysis reported in Table 1.

Referring to Table 2, the analysis of covariance showed that (this analysis partialed-out the effect which might have been caused by intelligence) the adjusted OTAT mean score was 47.32 for the one year group. Whereas, the adjusted OTAT mean for the two year group was 51.68. The converted t-value for this analysis is -2.86, which is significant at the .01 level.

Therefore, the answer to this part of question number one is--yes (remembering that this analysis was conducted with small n's), in this case the students that received the most instruction (two years, tenth and eleventh grade) did have a higher mean score when compared with the one year group (eleventh grade only), partialing out the confounding effect of heterogenous intelligence.

Question #2

Is there any difference in shop achievement, as measured by the OTAT total score, between the two groups of students (tenth and eleventh grade versus eleventh grade only) for the following occupational shops?

Shop Areas

I. Automotive Mechanic

II. Machine Trades

III. Auto Body

IV. Carpentry

V. Mixed Group (consisting of the following shops: Welding, Electricity, Electronics, and Mechanical Drafting).

In an attempt to answer this question of whether receiving more or less vocational instruction effects shop achievement as measured by the OTAT, the two groups (one group containing tenth and eleventh grade students and another containing only eleventh grade students) were compared. The groups were compared on their total shop scores which were converted to standard scores, with a mean of 50 and a standard deviation of 10.

The statistical tests employed for this question was the Behrens-Fisher t' test and the analysis of covariance which compared the mean scores of the groups under investigation.

At this point the author would caution the reader that a significant intelligence difference has been detected between the two groups under consideration. In order to avoid a misinterpretation of the

discussion of the analysis that follows, it is suggested that the statistical analysis section (presented in Chapter 3) be read, for an understanding of the findings.

A discussion of the statistical results of these tests for each cluster follows. Additionally, Table 2 was devised to enable the reader to visually inspect the results of both tests. Table 2 provides the means, standard deviations, converted group means and t-values for each test.

Automotive Mechanic

The total score means of the automotive mechanic shop were compared between the two groups of students who had varying lengths of vocational instruction. Table 2 reveals a mean OTAT score of 50.36, with a standard deviation of 9.77 for the group that received two years of instruction (tenth and eleventh grades). The same table shows the other group of students that received only one year of instruction (eleventh grade) with a mean OTAT score of 52.80 and a standard deviation of 10.87. The t' test between the means produced a t-value of .538, which is not significant at the .05 level.

Therefore, the results of the t' test suggest that there was no significant difference between the total shop scores for the students that received one year of instruction, when compared to the students that received two years.

The analysis of covariance test between the one year group and the two year group produced converted mean OTAT scores of 51.02 and 51.98 respectively. The analysis between the two OTAT means produced a t-value of .208, which is not significant at the .05 level.

Therefore, the results of the analysis of covariance suggest that there was no significant difference between the total shop scores for the students that received one year of instruction, when compared to the students that received two years.

Machine Trades

The OTAT total score means of machine trades shop were compared between the two groups of students who had varying lengths of vocational instruction. Table 2 reveals a mean OTAT score of 48.67, with a standard deviation of 9.11 for the group that received two years of instruction (tenth and eleventh grades). The same table shows the other group of students that received only one year of instruction (eleventh grade) with a mean OTAT score of 48.00 and a standard deviation of 2.24. The t' test between the means produced a t-value of -.209, which is not significant at the .05 level.

Therefore, the results of the t' test suggest that there was no significant difference between the total shop scores for the students that received one year of instruction when compared to the students that received two years.

The analysis of covariance test between the one year group and the two year group produced converted mean scores of 44.92 and 50.38 respectively. The analysis between the two means produced a t-value of -1.745, which is not significant at the .05 level.

Therefore, the results of the analysis of covariance suggest that there was no significant difference between the total shop scores for the students that received one year of instruction when compared to the students that received two years.

Auto Body

The OTAT total score means of the auto body shop were compared between the two groups of students who had varying lengths of vocational instruction. Table 2 reveals a mean score of 48.20, with a standard deviation of 7.01 for the group that received two years of instruction (tenth and eleventh grades). The same table shows the other group of students that received only one year of instruction (eleventh grade) with a mean score of 52.67 and a standard deviation of 8.34. The t' test between the means produced a t-value of 1.066, which is not significant at the .05 level.

Therefore, the results of the t' test suggest that there was no significant difference between the total shop scores for the students that received one year of instruction, when compared to the students that received two years.

The analysis of covariance test between the one year group and the two year group produced converted mean scores of 51.91 and 49.56 respectively. The analysis between the two means produced a t-value of .607, which is not significant at the .05 level.

Therefore, the results of the analysis of covariance suggest that there was no significant difference between the total shop scores for the students that received one year of instruction, when compared to the students that received two years.

Carpentry

The OTAT total score means of the carpentry shop were compared between the two groups of students who had varying lengths of vocational

instruction. Table 2 reveals a mean score of 51.21, with a standard deviation of 12.44 for the group that received two years of instruction (tenth and eleventh grades). The same table shows the other group that received only one year of instruction (eleventh grade) with a mean score of 49.21 and a standard deviation of 7.20. The t' test between the means produced a t-value of -.540, which is not significant at the .05 level.

Therefore, the results of the t' test suggest that there was no significant difference between the total shop scores for the students that received one year of instruction, when compared to the students that received two years.

The analysis of covariance test between the one year group and the two year group produced converted mean scores of 48.36 and 52.37 respectively. The analysis between the two means produced a t-value of -1.520, which is not significant at the .05 level.

Therefore, the results of the analysis of covariance suggest that there was no significant difference between the total shop scores for the students that received one year of instruction, when compared to the students that received two years.

Mixed Group (Consisting of the Following Shops: Welding, Electricity, Electronics and Mechanical Drafting)

The OTAT total score means of the mixed group were compared between the two groups of students who had varying lengths of vocational instruction. Table 2 reveals a mean score of 53.14, with a standard deviation of 6.62 for the group that received two years of instruction (tenth and eleventh grades). The same table shows the other group of students

which received only one year of instruction (eleventh grade) with a mean score of 44.21 and a standard deviation of 5.98. The t' test between the means produced a t-value of -3.253, which is significant at the .01 level.

Therefore, the results of the t' test suggest that there was a significant difference between the total shop scores. The group of students that received two years of instruction had a higher mean score on the OTAT.

The analysis of covariance test between the one year group and the two year group produced converted scores of 44.15 and 53.41 respectively. The analysis between the two means produced a t-value of -3.694, which is significant at the .01 level.

Therefore, the results of the analysis of covariance suggest that there was a significant difference between the total shop scores. The group of students that received two years of instruction had a higher mean score on the OTAT than the students with one year of instruction.

Question #3

Do the profiles of the two groups of students (tenth and eleventh versus eleventh grade only) differ on the OTAT sub-test scores for each shop area?

In order to answer this question Figures 1, 2, 3 and 4 have been devised to visually display the mean OTAT sub-test scores for the two groups (tenth and eleventh grade versus eleventh grade only) for each shop. The sub-tests scores include the sub-divisions of each shop and the short form test of academic aptitude. The percentile profiles are based upon the State of Ohio 1973 norms for eleventh grade students.

The sub-test scores include major divisions of each shop, and vary in numbers ranging from a high of 18 to a low of 8. The Mechanical Drafting test has 18 sub-tests and Basic Electronics has only 8. Additionally, the sub-test score provides the short form test of academic aptitude (SFTAA), which according to the Ohio Trade and Industrial Education Services can provide a relatively short, but accurate estimation of the intelligence level and academic aptitude of the vocational students tested.

The Williamsport group (grade eleven only) is indicated in Figures 1, 2, 3 and 4 by the solid line. Whereas, the non-Williamsport group (tenth and eleventh grades) is indicated by the dash line.

An examination of the profiles show the one year group with higher scores than the two year group on the Short Form of Academic Achievement. Additionally, this achievement advantage seems to have benefited the one year group, because generally their sub-part scores were higher than the two year group. Where this is not the case, and the two year group achieved higher, the reason could be that the instructional unit being measured had not been covered by the one year group. Of all the profiles, the carpentry shop groups were the most similar.

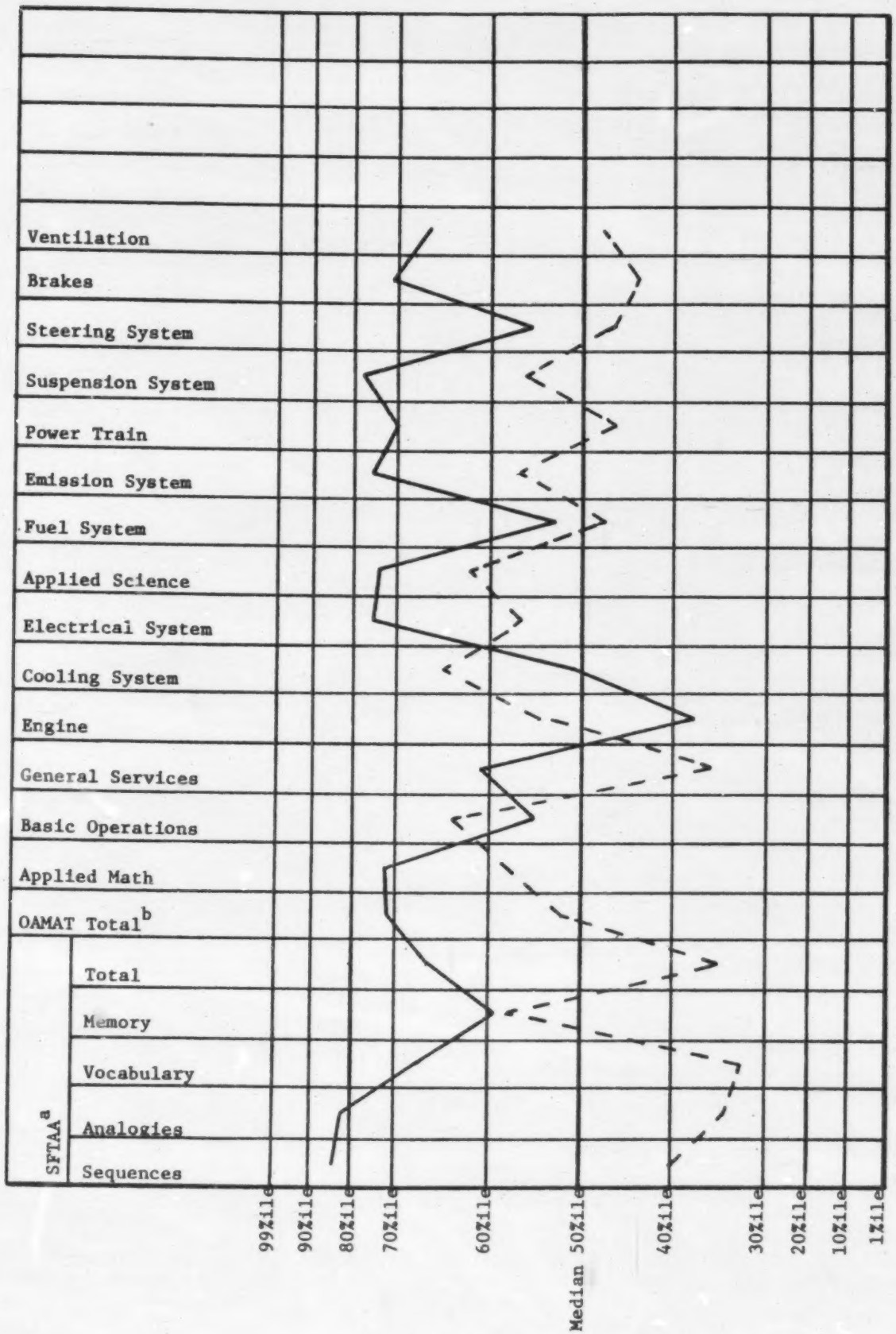

Figure 1. Ohio Automotive Mechanics Achievement Test Student Profiles for the Tenth and Eleventh Grade (dotted line) and Eleventh Grade (solid line).

Note: [a]Short Form of Academic Aptitude [b]Ohio Automotive Mechanic Achievement Test Total

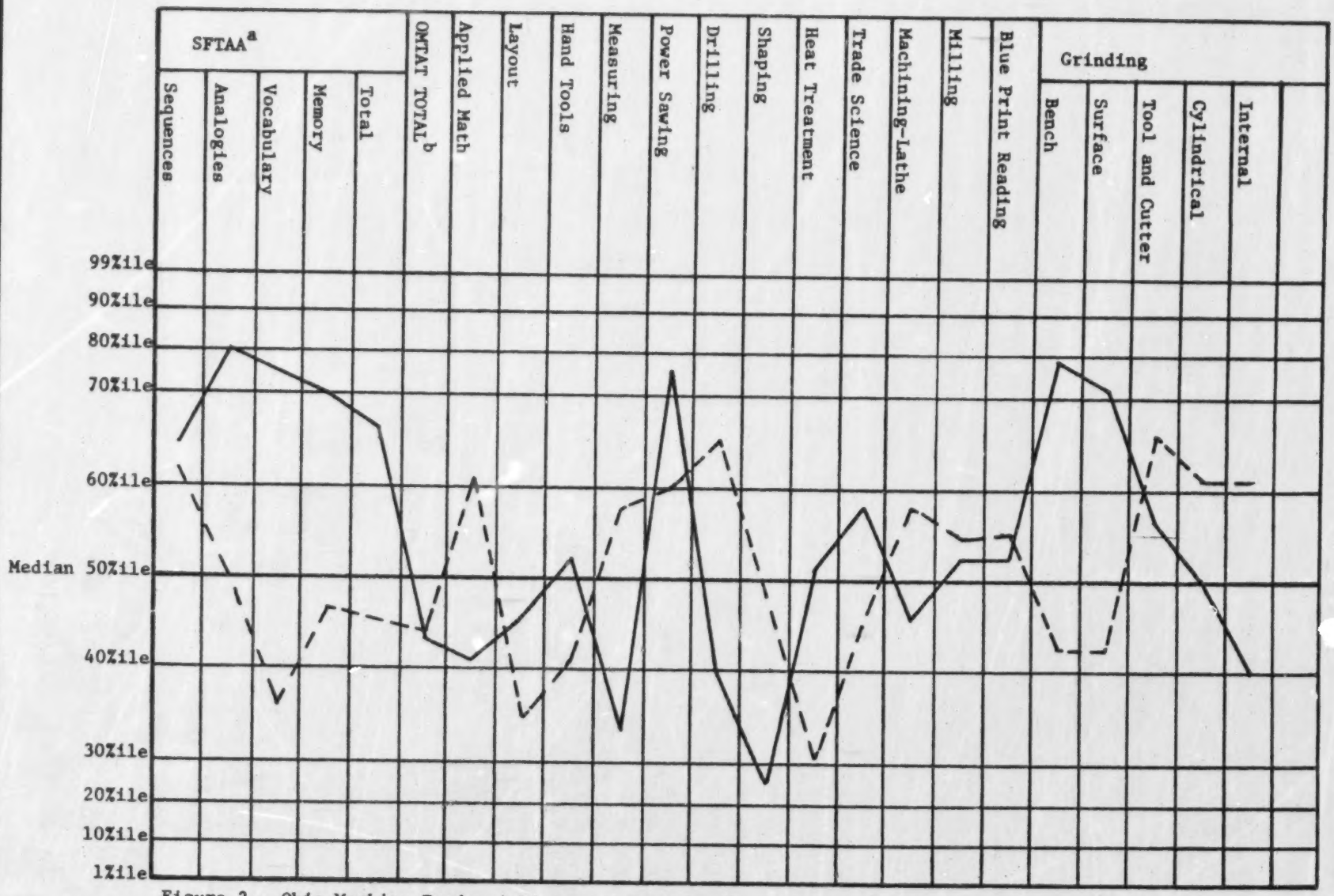

Figure 2. Ohio Machine Trades Achievement Test Student Profiles for the Tenth and Eleventh Grade (dotted line) and Eleventh Grade (solid line).

Note: [a]Short Form of Academic Achievement [b]Ohio Machine Trades Achievement Test Total

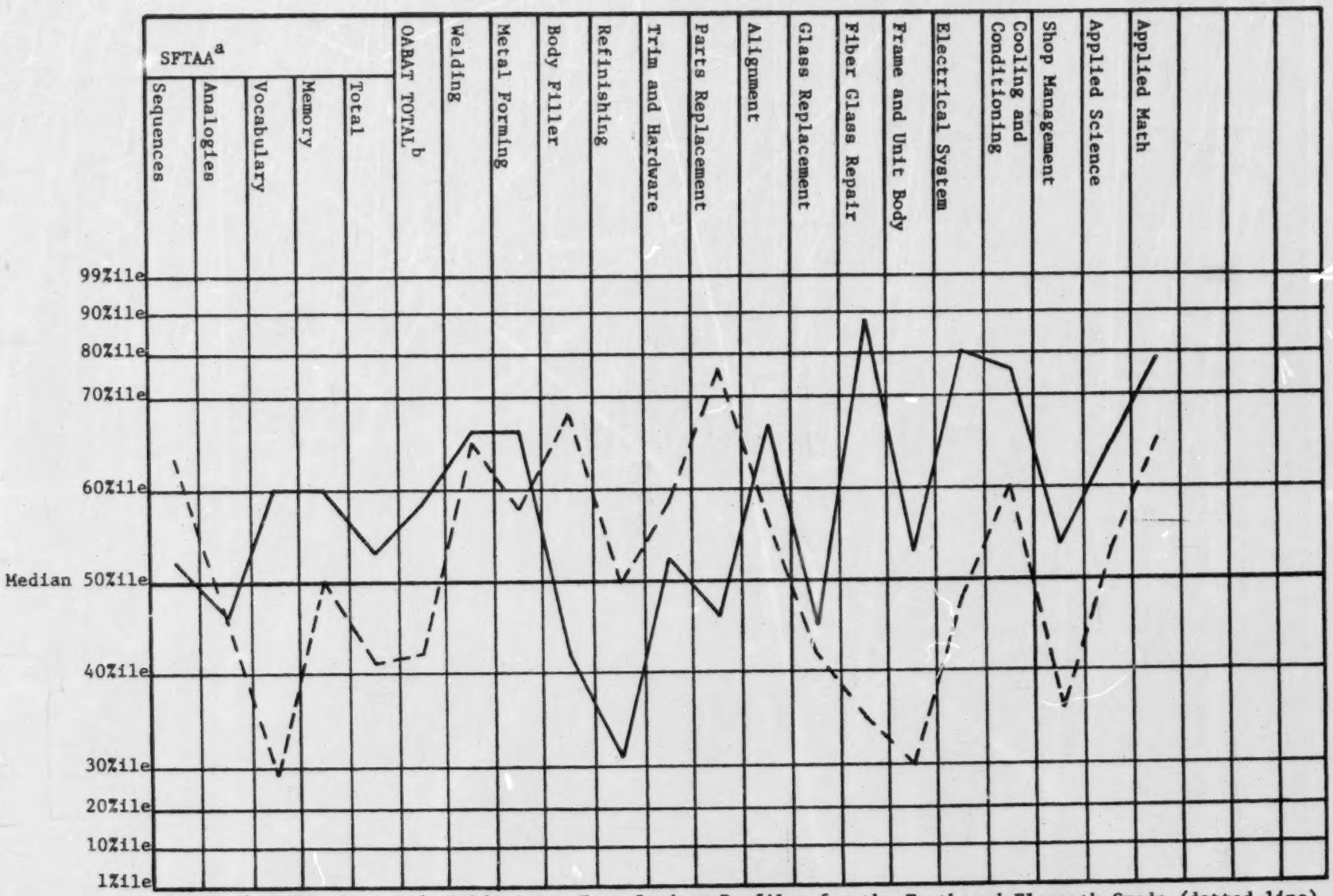

Figure 3. Ohio Auto Body Achievement Test Student Profiles for the Tenth and Eleventh Grade (dotted line) and Eleventh Grade (solid line).

Note: [a]Short Form of Academic Aptitude [b]Ohio Auto Body Achievement Test Total

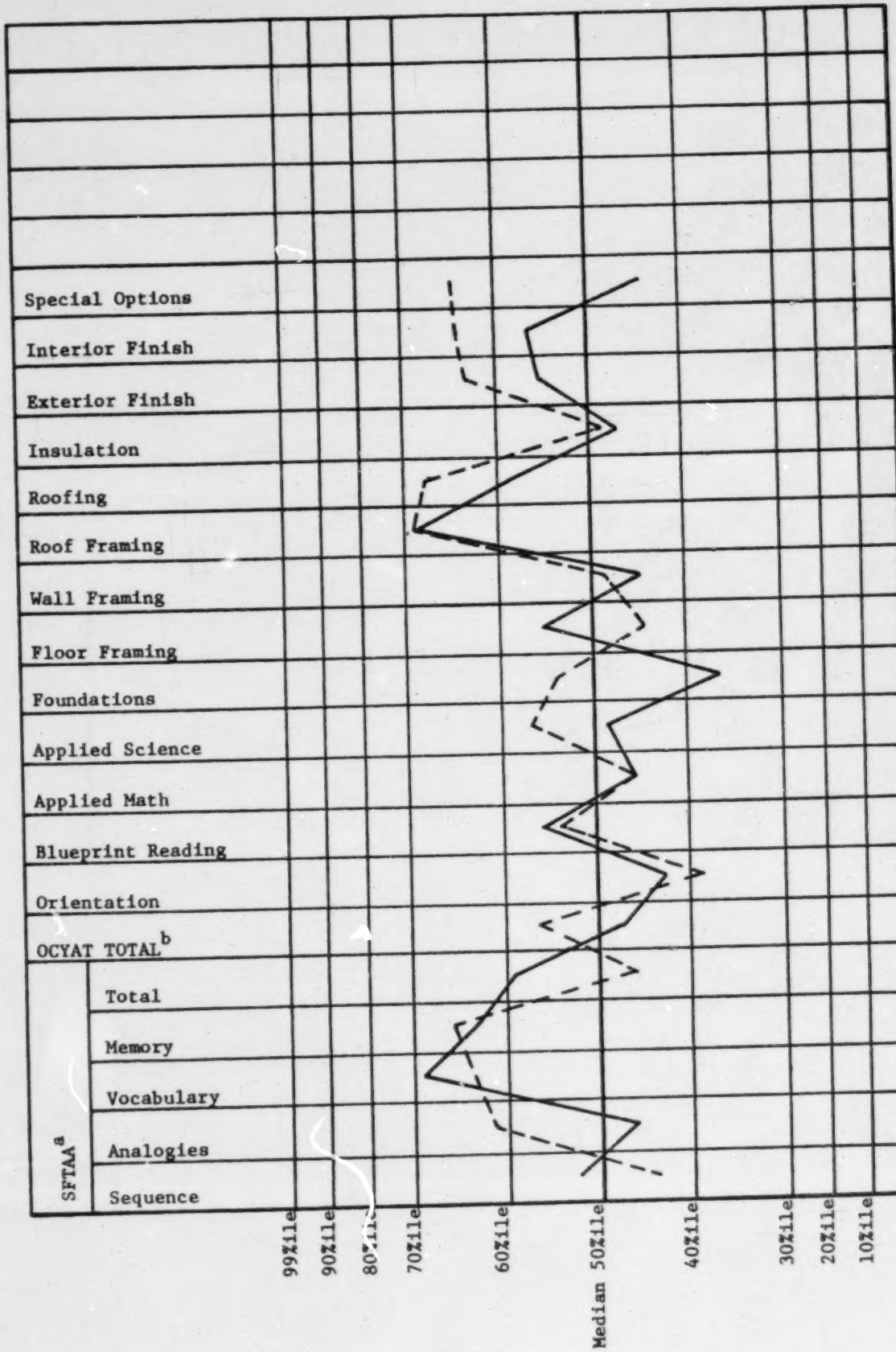

Figure 4. Ohio Carpentry Achievement Test Student Profiles for the Tenth and Eleventh Grade (dotted line) and Eleventh Grade (solid line).

Note: [a]Short Form Test of Academic Aptitude [b]Ohio Carpentry Achievement Test Total

V

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

This chapter provides a summary of this study, conclusions based on the findings, implications for vocational instruction and recommendations for further study.

Summary

Introduction

Vocational education received its first major stimulus from monies provided for in the Smith-Hughes Act of 1917. The ensuing years since this Act witnessed many additions and revisions to vocational education. However, not until the passage of the Vocational Education Act of 1963 did federal vocational education legislation focus on people in need of vocational education, which was a departure from all previous legislation which emphasized type of occupation. Due in part to the funding that is being made available for support of vocational education and the questionable relevance traditional education holds for some individuals, vocational education has grown in size and scope. But, the growth in vocational education (as well as all education) raises a serious philosophical question that has perplexed behavioral science researchers for some time--When is an individual sufficiently mature to make a reasonably accurate occupational choice?

This study was conducted in an attempt to answer the question concerned with whether delayed selection of an occupational shop will enhance or retard an individual's achievement in that program.

Statement of the Problem

The general purpose of this study was to examine the difference in shop achievement between students who had entered a specific vocational program in tenth grade as opposed to eleventh grade. This study consisted of two groups of vocational students, the first group of students had completed both the tenth and eleventh grades of the vocational program and the second group had completed only one year of study (the eleventh grade) in the same vocational program. The shop achievement of these two groups was measured by the Ohio Trade and Industrial Education Achievement Tests (OTAT) total score.

The specific purpose of this study was to examine the differences between these two groups in an attempt to answer the following questions:

1. Is there any difference in shop achievement, as measured by the OTAT total score between the group of students that have completed two years of vocational education (tenth and eleventh grades) and the group of students that completed one year (eleventh grade only) considering all occupations together?
2. Is there any difference in shop achievement, as measured by the OTAT total score, between the two groups of students (tenth and eleventh grade versus eleventh grade only) for the following occupational shops?

Shop Areas

I. Automotive Mechanic

II. Machine Trades

III. Auto Body

IV. Carpentry

V. Mixed Group (consisting of the following shops: Welding, Electricity, Electronics, and Mechanical Drafting)

3. Do the profiles of the two groups of students (tenth and eleventh grade versus eleventh grade only) differ on the OTAT subtest scores for each shop area?

Procedure

The sample used in this study consisted of two groups of vocational high school pupils. One group of students (from Williamsport) had studied in the shop in which they were compared for one year (eleventh grade). Whereas, the other group (a totally non-Williamsport group) had exposure to the same shops for twice as long (tenth and eleventh grades). The students were from the following shop areas: Automotive Mechanic, Machine Trades, Auto Body, Carpentry, Welding, Electricity, Electronics and Mechanical Drafting.

The total sample consisted of 117 participants: 71 from the eleventh grade only, and 46 from the tenth and eleventh grade.

The criterion data used to compare the two groups of students who had varying lengths of vocational instruction was the Ohio Trade and Industrial Education Achievement Test (OTAT). This data was collected in conjunction with the longitudinal Vocational Development Study (VDS)

project currently being conducted in the Dpeartment of Vocational Education at The Pennsylvania State University. This test battery is specifically designed for the evaluation and measurement of vocational achievement.

Two statistical approaches were utilized to analyze the data--Behrens-Fisher t' test and the analysis of covariance. In addition to analyzing the data by these two techniques--profiles of the sub-part mean scores of the following shops were developed: Automotive, Machine Trades, Auto Body and Carpentry.

Findings

A t' test and an analysis of covariance was conducted between the two groups of students in the study for the total sample and for five separate shop groups. The criterion variable used to compare the groups was mean total OTAT scores standardized across all shops.

The t-value was calculated to test the general null hypothesis, that the mean total OTAT scores of the groups were equal using the t' test. In addition, because a significant difference in intelligence was detected between the two groups studied, the groups were also compared using an analysis of covariance (which partialed-out the effect of intelligence). This test also had for its general null hypothesis, that the converted mean OTAT scores of the groups were equal. This methodology was used to answer questions one and two.

The t' test for question one found the two Mixed Groups (consisting of the Welding, Electricity, Electronics and Mechanical Drafting) to be significantly different at the .01 level in terms of OTAT scores. The analysis of covariance found the two Total groups (consisting of all

shops) and the two Mixed Groups to be significantly different at the .01 level on the criterion-OTAT. In all cases the two year group scored higher than the one year group.

Question three was answered by developing profiles of the mean OTAT sub-part scores for the following shops: Automotive, Machine Trades, Auto Body and Carpentry. The results of these profiles generally show the one year group with higher mean achievement scores than the two year group. Additionally, the one year group usually had higher mean OTAT sub-part scores than the two year group. This finding could be attributed to the fact that the one year group possessed higher intelligence. Where the two year group did score higher than the one year group, the material in question may not have been covered by the one year group.

Conclusions

Question One

This question is concerned with whether students receiving two years of vocational instruction are more knowledgable in their trade, compared with students that received one year of instruction. The groups of students being compared had completed the eleventh grade in their respective shops. The major difference between the two groups was; the one group entered their respective shops in the tenth grade, whereas the other group did not enter their shops until the eleventh grade. The criterion variable used to compare the two groups under consideration was the mean total OTAT score for each trade area converted to standard scores based on Ohio norms.

However, prior to the statistical tests that were conducted on the groups, a significant intelligence difference was detected between the groups, thus two different statistical tests were employed to determine if the two groups differed in terms of mean total OTAT scores. The first test (t') was conducted without concern for the differences in the intelligence factor, whereas the second test (analysis of covariance) equated the mean total OTAT scores as if the two groups possessed homogeneous intelligence.

When the mean total OTAT scores were not adjusted to compensate for the intelligence factor, the statistical test did not detect a difference between the two groups, thus suggesting the two year group had not benefited from the additional year of instruction. However, when the mean total OTAT scores were adjusted as if both groups had equal intelligence, the statistical tests reveal that the two year group did benefit from the additional year of instruction.

Question Two

This question compared the mean total OTAT scores of the shop areas under consideration to ascertain if receiving two years of vocational instruction will effect learning in a particular shop when compared with a group of students that had studied in the same shop for only one year. The shop areas being compared were: Automotive Mechanic, Machine Trades, Auto Body, Carpentry and Mixed Group (consisting of the following shops: Welding, Electricity, Electronics and Mechanical Drafting).

Because a difference in intelligence between the two groups has been detected, the same two statistical tests were conducted as were used for question one. The first test (t') was conducted without regard

for the intelligence factor, whereas the second test (analysis of covariance) equated the mean total OTAT scores as if the two groups had homogeneous intelligence.

Using both types of analysis, the group of students that had studied two years from the Mixed Group had significantly higher mean total OTAT scores than the one year group. The other groups (Automotive, Machine Trades, Auto Body and Carpentry) were not found to differ on their mean total scores.

The conclusion is that the only group of students that benefited from the additional year of vocational instruction was the Mixed Group. At least part of the explanation for why significant differences were not found for individual shops lies in the very small sample sizes available. Conversely, the Mixed Group and the total sample (question one) did not suffer from this problem and therefore did yield differences.

Question Three

In an attempt to answer this question, profiles (Figures 1, 2, 3 and 4) were developed to give the reader a visual display of the two groups under consideration. The one year group (totally Williamsport - 1 year) was displayed by a solid line, whereas the two year group (non-Williamsport - 2 years) was displayed by a dotted line.

In all cases the one year groups had higher mean intelligence test total scores (SFTAA) than the two year groups and were usually higher on most sub-parts of the test. The one year group of students from Automotive and Auto Body had higher mean total shop achievement scores than the two year group. However, the two year groups from the Machine Trade and Carpentry had higher mean total shop achievement scores than the one

year group. The groups that came closest to resembling each other were those in Carpentry, where generally their profile on the sub-part means scores were similar.

The added advantage of intelligence appears to have benefited the one year group, because in many cases their sub-part scores were higher than those of the two year group. Where this was not the case, this may be attributed to the nature of the programs (i.e., the unit under consideration might not as yet have been covered by the one year group).

Recommendations

In view of the findings and conclusions of this study the following recommendations are suggested.

1. The findings suggest that students who begin vocational education in the tenth grade do somewhat better than those beginning in eleventh grade when achievement is measured at the end of eleventh grade. Further research needs to be conducted to determine if this is true for all shops and would hold up over longer time periods (i.e., at the end of twelfth grade). Because the findings suggest that although some students seem to benefit from an early shop selection and entry, there is reason to believe that this is not true for all students in all shops, or for all time periods. Also, the amount of increase in trade knowledge for the two year group is small compared to the additional one year time advantage.
2. It is recommended that this study be replicated. This time with a larger group of students that have homogeneous intelligence.

Also, the comparison would be made at the end of twelfth grade when one group has had three years of shop instruction versus two years for the other group.

3. It is recommended that in replicating this study other measures in addition to the Ohio Trade and Industrial Education Achievement Test (a pencil and paper achievement test) be used as a criterion variable. Measures of performance, satisfaction and on-the-job success should also be employed.

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